REMARKS/ARGUMENTS

STATUS OF THE CLAIMS

Claims 69-104, 106-183, and 199 are pending with entry of this amendment, claim 105 being cancelled herein, claims 1-68 and 184-198 having been cancelled in a previous amendment (although the Action noted these as being withdrawn), and claim 199 being added herein. Claims 79, 96, 102, and 106 are amended herein, to more clearly claim the desired embodiments of the invention. These amendments introduce no new matter and support is replete throughout the specification. These amendments are made without prejudice to renewal of the claims in their original form and are not to be construed as abandonment or dedication of the previously claimed subject matter or agreement with any objection or rejection of record.

With respect to claim 79, support for the amendment can be found throughout the specification. For example, see the specification at paragraph 118, where a wide variety of exemplary semiconducting materials suitable for fabrication of nanowires are listed. Additional materials useful for fabrication of semiconducting nanowires are detailed in the specification, including materials for fabrication of core-shell nanowires (see, e.g., paragraphs 189 and 197). A large number of exemplary semiconducting materials are provided that are not magnetic, while paragraph 108 indicates that some nanowires are magnetic. Support for nanowires being formed from non-magnetic materials is thus implicit throughout the specification.

With respect to claim 199, support for the amendment can be found throughout the specification, as well as in claim 79 as originally filed. For example, see the specification at paragraph 116.

With respect to claim 96, support for the amendment can be found throughout the specification, as well as in claim 96 as originally filed. For example, see the specification at paragraph 125.

With respect to claims 102 and 106, support for the amendment can be found throughout the specification, as well as in claims 102, 105, and 106 as originally filed. For example, see the specification at paragraphs 120, 128-129, 133, and 135, 184, which describe

(*inter alia*) various matrix materials and dispersal of nanostructures in matrix components to form composites.

Applicants submit that no new matter has been added to the application by way of the above claim amendments. Accordingly, entry of the Amendment is respectfully requested.

The action of May 6, 2005 included: claim rejections for alleged anticipation (items 1-3) and claim rejections for alleged obviousness (items 4-6). Applicants traverse all rejections, to the extent that they may be applied to the amended claims, for the reasons noted herein.

THE INFORMATION DISCLOSURE STATEMENT

Applicants note with appreciation the Examiner's thorough consideration of the references cited in the Information Disclosure Statements (Form 1449) submitted on March 12, 2004 and July 12, 2004.

THE CLAIMS ARE FREE OF TALROZE (ACTION ITEM 2)

Claims 69-79, 96, 102, 131, 132, and 135 were rejected for alleged anticipation under 35 USC 102(e) by Talroze et al. Applicants respectfully traverse these rejections.

In order for a reference to anticipate an invention, the reference must teach each and every element of the claimed invention.

Talroze describes a material comprising a polymer in which solvated electrons ("free polarons"), dipole groups, and positive ions self-organize into superconducting domains within the polymer. These self-organized domains are termed "superpolarons" or "quantum nanowires" by Talroze et al.

The claims are not anticipated by Talroze because the claims are directed to a composite material. As paragraph 3 of the instant application makes clear, a composite material is formed by combining two or more materials having different properties, and the original materials can still be identified within the resulting composite. In a typical composite, a matrix material surrounds and binds together discrete units of a second material;

the composite materials of the instant application include nanostructures in a polymer, small molecule, or other matrix.

Talroze clearly does not describe a composite material. Talroze's "quantum nanowires" are not discrete units that are combined with a polymer; instead, they are self-organized regions within the polymer. They are not physically distinct from the polymer; see, e.g., column 7 lines 2-4, which indicates that "The ions and dipole groups participating in the formation of a superpolaron are attached to randomly directed polymer chains".

In addition, Applicants note that the "quantum nanowires" of Talroze do not correspond with nanowires (or any other nanostructures) as described in the instant application. For example, the "quantum nanowires" of Talroze are not physically distinct structures that can be produced and manipulated in the absence of the polymer in which they are formed.

Furthermore, Talroze does not teach at least the following elements which are present in the independent claims: a small molecule, molecular, glassy, or crystalline matrix, a matrix or components thereof used to orient nanowires, distribution of a composite material on a layer of material that conducts substantially only electrons or substantially only holes, core-shell nanostructures, ferroelectric nanostructures, branched nanowires, and/or a matrix having an affinity for a nanostructure surface or surface ligand. Additional points of distinction are present in the dependent claims, but because independent claims 69, 70, 79, 96, 102, 131, 132, and 135 are not anticipated, it is not necessary to address each additional point.

Because Talroze does not teach composite materials including nanostructures that meet the limitations recited in the claims, the rejections must be withdrawn.

THE CLAIMS ARE FREE OF MAJUMDAR (ACTION ITEM 3)

Claims 108, 116, and 122 were rejected for alleged anticipation under 35 USC 102(e) by Majumdar et al. Applicants respectfully traverse these rejections.

In order for a reference to anticipate an invention, the reference must teach each and every element of the claimed invention.

Majumdar describes nanowire heterostructures, including core-shell heterostructures. However, Majumdar fails to teach all the limitations of claim 108, claim 116, or claim 122.

With respect to claims 108 and 122, Majumdar does not teach a composite material including a matrix comprising a semiconducting material. Further, Majumdar fails to teach the semiconducting matrix having a type I band offset from the first material comprising the nanostructures (as is specified in claim 108) or having a type II band offset from the first material comprising the nanostructures (as is specified in claim 122).

With respect to claim 116, Majumdar fails to teach a composite material including core-shell nanostructures in which the core and shell have a type II band offset.

Although the Action notes that Majumdar describes a composite material comprising one or more nanostructures with a conduction and valence band at paragraph 222, Applicants respectfully note that this paragraph describes longitudinal heterostructure nanowires and does not make reference to either core-shell nanostructures or to composites. The Action notes that paragraph 121 describes conduction band offsets; however, Applicants note that the offset described is for GaSb quantum dots on GaAs, not for either the core and shell of core-shell nanostructures or for nanostructures and a semiconducting matrix.

Because Majumdar does not teach composite materials meeting the limitations recited in the claims, the rejections should be withdrawn.

THE CLAIMS ARE NOT OBVIOUS OVER TALROZE (ACTION ITEM 5)

Claims 80-95, 97-101, 103-107, 109-115, 117-121, 123-130, 133-134, and 136-183 were rejected for alleged obviousness under 35 USC 103(a) over Talroze et al. Applicants respectfully traverse these rejections.

Three requirements must be met for a *prima facie* case of obviousness. First, the prior art reference(s) must teach or suggest all of the limitations of the claims (M.P.E.P § 2143.03). Second, there must be a motivation to modify the reference or combine the teachings to produce the claimed invention (M.P.E.P. § 2143.01). Third, a reasonable expectation of success is required (M.P.E.P. § 2143.02). The teaching or suggestion to combine and the expectation of success must be both found in the prior art and not based on Applicants' disclosure (M.P.E.P. §2143). These requirements are not met by Talroze.

As noted above, Talroze does not describe composite materials, or even nanostructures, such as those of the instant application. Neither does Talroze describe compositions that can be used to form such composite materials. Talroze thus fails to teach or even suggest all of the limitations of the claims.

In addition, motivation to modify the teachings of Talroze is lacking. The Action noted that Talroze does not disclose the specific compositions and materials as claimed, but alleges that use of these materials and compositions would have been obvious since selection of a known material on the basis of its suitability for an intended use is considered to be within the general skill of a worker in the art, citing *In re Leshin*. However, in *In re Leshin*, both the material *and* the use were previously known. As noted above, this is not true with respect to the instant application - Talroze teaches neither. Therefore, even if it were within the general skill of a worker in the art to select another polymer suitable for self-organization of superpolarons based on the teachings of Talroze, which applicants do not concede, a choice of materials to create the composite materials or compositions of the instant application is not obvious from Talroze et al. Achieving the composite materials and compositions of the present invention requires more than mere selection of materials on the basis of previously known criteria.

Accordingly, the rejections should be withdrawn.

THE CLAIMS ARE NOT OBVIOUS OVER MAJUMDAR (ACTION ITEM 6)

Claims 109-115, 117-121, and 123-130 were rejected for alleged obviousness under 35 USC 103(a) over Majumdar et al. Applicants respectfully traverse these rejections.

Again, three requirements must be met for a *prima facie* case of obviousness: the prior art reference(s) must teach or suggest all of the limitations of the claims, there must be a motivation to modify the reference or combine the teachings to produce the claimed invention, and a reasonable expectation of success is required. Majumdar fails to teach or suggest all the limitations of the claims, and motivation to modify the teachings of Majumdar is lacking.

In paragraph 165, Majumdar describes nanowires embedded in a matrix; importantly, however, the nanowires are embedded in the matrix "*to provide mechanical strength*" (emphasis added). The matrix is not described as fulfilling any other purpose in the

resulting composition. Indeed, when a matrix is mentioned again in paragraph 212, nanowires are "*supported* in a solid polymer or glassy matrix" (emphasis added). In one aspect, the composite of Majumdar exploits "the ultra-low thermal conductivity of polymers" (paragraph 166). However, Majumdar clearly does not contemplate use of matrices having relevant electrical properties. Majumdar certainly does not describe semiconducting (or other conductive) matrices.

Similarly, with respect to nanostructures, Majumdar describes coaxial heterostructure nanowires (COHNs) having a core and a sheath (e.g., at paragraphs 9, 11, 71, and 111). However, the COHNs described have a type I band offset between the core and the sheath. See, e.g., the exemplary configurations in paragraph 111 and the conduction band diagram of a COHN in Figure 15. COHNs having a type II band offset between the core and the sheath are not described. Further, the applications Majumdar describes for COHNs require that charges be retained in the core or be injected into the core; charge separation devices are not described. Thus, Majumdar does not contemplate use of COHNs having a type II band offset between the core and the sheath or creation of composites that facilitate charge separation.

The Action alleges that "Applicant has not disclosed any criticality in the specific material options or compositions in Applicant's specification." To the contrary, with respect to claims 109-115, claim 108 and the specification at paragraph 136 clearly indicate that the matrix comprises a semiconducting material, and furthermore, a semiconducting material having a type I band offset with respect to a first semiconducting material comprising the nanostructures. Similarly, with respect to claims 123-130, claim 122 and the specification at paragraph 143 indicate that the matrix comprises a semiconducting material having a type II band offset with respect to a first semiconducting material comprising the nanostructures. As is clearly stated in the specification, matrices with these properties are specified to facilitate charge recombination or charge separation in the respective resultant composite materials. Criticality in choice of materials has thus been shown.

With respect to claims 117-121, claim 116 and the specification at paragraph 140 indicate that the nanostructures comprise a core and a shell having a type II band offset. As is indicated in the specification, a composite including such nanostructures in a matrix

can support charge separation (unlike composites including core-shell nanostructures with a type I offset, which facilitate charge recombination). Criticality in choice of materials has thus been shown for these claims as well. In addition, Applicants note that claim 120 describes desirable electrical properties of the matrix.

The action noted that Majumdar fails to disclose the specific compositions and materials as claimed, but alleges that use of these materials and compositions would have been obvious since selection of a known material on the basis of its suitability for an intended use is considered to be within the general skill of a worker in the art, citing *In re Leshin.* However, as noted above, in *In re Leshin*, both the material and the use were previously known. This is not the case with the instant application. For instance, with respect to claims 109-115 and 123-130, Majumdar teaches neither composite materials that facilitate charge separation and recombination nor semiconducting matrices having appropriate band offsets from nanostructures. Selection of appropriate matrices and/or matrix-nanostructure combinations to produce the composite materials of the instant claims is certainly not obvious on the basis of Majumdar, since Majumdar describes matrices imparting mechanical strength and having low thermal conductivity, not semiconducting matrices with specific types of band offsets chosen to imbue the resulting composites with desirable electrical properties. With respect to claims 117-121, Majumdar describes neither composite materials that facilitate charge separation nor core-shell nanostructures having a type II band offset between the core and the shell. Selection of appropriate nanostructures to produce the composite materials of the claims is not obvious on the basis of Majumdar.

Accordingly, for at least these reasons, the rejections should be withdrawn

CONCLUSION

In view of the foregoing, Applicant(s) believe(s) all claims now pending in this application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the claims are deemed not to be in condition for allowance after consideration of this Response, a telephone interview with the Examiner is hereby requested. Please telephone the undersigned at (510) 337-7871 to schedule an interview.

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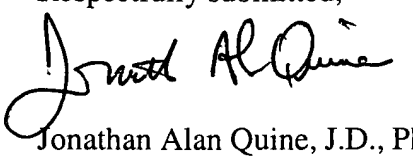
Respectfully submitted,



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Attachments:

1) A transmittal sheet;
2) A fee transmittal sheet;
3) An Information Disclosure Statement
4) A PTO-1449 form; and,
5) A receipt indication postcard.